

lation apparatus **1020** and is removed from microchannel distillation apparatus **1020** through line **1021**. The remainder of the raw natural gas product mixture flows through line **1022** to microchannel distillation apparatus **1030**. Butanes and butylenes are separated from the natural gas product mixture in microchannel distillation apparatus **1030** and flow from microchannel distillation apparatus **1030** through line **1031**. The remainder of the raw natural gas product mixture flows through line **1032** to microchannel distillation apparatus **1040** where propanes and propylene are separated from the product mixture. Propanes and propylene flow from the microchannel distillation apparatus **1040** through line **1041**. The remainder of the product mixture flows through line **1042** to microchannel distillation apparatus **1050**. In microchannel distillation apparatus **1050** ethane and ethylene are separated from the product mixture and flow from microchannel distillation apparatus **1050** through line **1051**. The remaining product comprises methane which flows from microchannel distillation apparatus **1050** through line **1052**. The raw natural gas product mixture flowing through line **1009** to bulk liquids separator **1010** may be at a pressure of about 10 to about 5000 psig, and in one embodiment about 10 to about 2500 psig; and a temperature of about  $-250$  to about  $500^{\circ}\text{C}$ ., and in one embodiment about  $-50$  to about  $300^{\circ}\text{C}$ . The product mixture flowing through line **1011** to microchannel distillation apparatus **1020** may be at a pressure of about 10 to about 5000 psig, and in one embodiment about 10 to about 2500 psig; and a temperature of about  $-250$  to about  $500^{\circ}\text{C}$ ., and in one embodiment about  $-50$  to about  $300^{\circ}\text{C}$ . The product mixture flowing through line **1022** to microchannel distillation apparatus **1030** may be at a pressure of about 10 to about 5000 psig, and in one embodiment about 10 to about 2500 psig; and a temperature of about  $-250$  to about  $500^{\circ}\text{C}$ ., and in one embodiment about  $-200$  to about  $300^{\circ}\text{C}$ . The product mixture flowing through line **1032** to microchannel distillation apparatus **1040** may be at a pressure of about 10 to about 5000 psig, and in one embodiment about 10 to about 2500 psig; and a temperature of about  $-225$  to about  $500^{\circ}\text{C}$ ., and in one embodiment about  $-200$  to about  $300^{\circ}\text{C}$ . The product mixture flowing through line **1042** to microchannel distillation apparatus **1050** may be at a pressure of about 10 to about 5000 psig, and in one embodiment about 10 to about 2500 psig; and a temperature of about  $-245$  to about  $500^{\circ}\text{C}$ ., and in one embodiment about  $-200$  to about  $300^{\circ}\text{C}$ . The methane flowing from microchannel distillation apparatus **1050** through line **1052** may be at a pressure of about 10 to about 5000 psig, and in one embodiment about 10 to about 2500 psig; and a temperature of about  $-245$  to about  $300^{\circ}\text{C}$ ., and in one embodiment about  $-200$  to about  $300^{\circ}\text{C}$ .

[0189] The refrigerant used in the separation system **1000** illustrated in FIG. 41 may be any refrigerant. The refrigerant flows through line **1059** to condenser **1060**, through condenser **1060** to line **1061**, through line **1061** to compressor **1065**, through compressor **1065** to line **1066**, through line **1066** to valve **1070**, through valve **1070** to line **1071**, through line **1071** to expansion device **1075**, through expansion device **1075** to line **1076**, through line **1076** to microchannel distillation apparatus **1050**, through apparatus **1050** to line **1077**, through line **1077** to expansion device **1080**, through expansion device **1080** to line **1081**, through line **1081** to microchannel distillation apparatus **1040**, through microchannel distillation apparatus **1040** to line **1082**, through line **1082** to expansion device **1085**, through expan-

sion device **1085** to line **1086**, through line **1086** to microchannel distillation apparatus **1030**, through microchannel distillation apparatus **1030** to line **1087**, through line **1087** to expansion device **1090**, through expansion device **1090** to line **1091**, through line **1091** to microchannel distillation apparatus **1020**, through microchannel distillation apparatus **1020** to line **1059**, and through line **1059** back to condenser **1060** where the cycle starts all over again. The refrigerant flowing through line **1059** from microchannel distillation apparatus **1020** to condenser **1060** may be at a pressure of about 10 to about 3000 psig, and in one embodiment about 20 to about 2500 psig; and a temperature of about  $-250$  to about  $300^{\circ}\text{C}$ ., and in one embodiment about  $-225$  to about  $300^{\circ}\text{C}$ . The refrigerant flowing through line **1061** from condenser **1060** to compressor **1065** may be at a pressure of about 10 to about 3000 psig, and in one embodiment about 20 to about 2500 psig; and a temperature of about  $-250$  to about  $300^{\circ}\text{C}$ ., and in one embodiment about  $-225$  to about  $300^{\circ}\text{C}$ . The refrigerant flowing through line **1066** from compressor **1065** to valve **1070** may be at a pressure of about 10 to about 3000 psig, and in one embodiment about 20 to about 2500 psig; and a temperature of about  $-250$  to about  $300^{\circ}\text{C}$ ., and in one embodiment about  $-225$  to about  $300^{\circ}\text{C}$ . The refrigerant flowing through line **1071** from valve **1070** to expansion device **1075** may be at a pressure of about 10 to about 3000 psig, and in one embodiment about 20 to about 2500 psig; and a temperature of about  $-250$  to about  $300^{\circ}\text{C}$ ., and in one embodiment about  $-225$  to about  $300^{\circ}\text{C}$ . The refrigerant flowing through line **1076** from expansion device **1075** to microchannel distillation apparatus **1050** may be at a pressure of about 10 to about 3000 psig, and in one embodiment about 20 to about 2500 psig; and a temperature of about  $-250$  to about  $300^{\circ}\text{C}$ ., and in one embodiment about  $-225$  to about  $300^{\circ}\text{C}$ . The refrigerant flowing through line **1077** from microchannel distillation apparatus **1050** to expansion device **1080** may be at a pressure of about 10 to about 3000 psig, and in one embodiment about 20 to about 2500 psig; and a temperature of about  $-250$  to about  $300^{\circ}\text{C}$ ., and in one embodiment about  $-225$  to about  $300^{\circ}\text{C}$ . The refrigerant flowing through line **1081** from expansion device **1080** to microchannel distillation apparatus **1040** may be at a pressure of about 10 to about 3000 psig, and in one embodiment about 20 to about 2500 psig; and a temperature of about  $-250$  to about  $300^{\circ}\text{C}$ ., and in one embodiment about  $-225$  to about  $300^{\circ}\text{C}$ . The refrigerant flowing through line **1082** from microchannel distillation apparatus **1040** to expansion device **1085**, may be at a pressure of about 10 to about 3000 psig, and in one embodiment about 20 to about 2500 psig; and a temperature of about  $-250$  to about  $300^{\circ}\text{C}$ ., and in one embodiment about  $-225$  to about  $300^{\circ}\text{C}$ . The refrigerant flowing through line **1086** from expansion device **1085** to microchannel distillation apparatus **1030** may be at a pressure of about 10 to about 3000 psig, and in one embodiment about 20 to about 2500 psig; and a temperature of about  $-250$  to about  $300^{\circ}\text{C}$ ., and in one embodiment about  $-225$  to about  $300^{\circ}\text{C}$ . The refrigerant flowing through line **1087** from microchannel distillation apparatus **1030** to expansion device **1090** may be at a pressure of about 10 to about 3000 psig, and in one embodiment about 20 to about 2500 psig; and a temperature of about  $-250$  to about  $300^{\circ}\text{C}$ ., and in one embodiment about  $-225$  to about  $300^{\circ}\text{C}$ . The refrigerant flowing through line **1091** from expansion device **1090** to microchannel distillation apparatus **1020** may be at a pressure of about 10